

Identification	Subject	PETE 312 Well Logging 6 ECTS
	Department	Petroleum Engineering
	Program	Undergraduate
	Term	Fall, 2023
	Instructor	Leyla Alimuradova
	E-mail:	leyla.alimuradova@gmail.com
	Classroom/hours	11 Mehseti str. (Neftchilar campus), Tuesday 18:30- 21:00
	Office hours	Friday, 15:00 - 17:00
Prerequisites	Petroleum Geology, basics of geosciences, physics	
Language	English	
Compulsory/Elective	Elective	
Required textbooks and course materials	<ol style="list-style-type: none"> 1. Djebbar Tiab, Erle C. Donaldson, 2010. "Petrophysics", Elsevier. 2. Darling, T., 2005, "Well Logging and Formation Evaluation", Gulf Pub. 3. Gary Mavko, Tapan Mukerji, Jack Dvorkin, 2009 "The Rock Physics Handbook", 4. Nnaemeka Ezekwe, 2011, "Petroleum reservoir engineering practice", Prentice Hall. 	
Course outline	<p>This course is designed for the bachelor and master students to study the properties of rocks and their interaction with fluids (gases, liquid hydrocarbons and formation aqueous solutions).</p> <p>Course address's introduction to the basic hydrocarbon reservoir formation evaluation using open-hole logs (, resistivity (micro and focused), gamma ray, self potential, caliper, density neutron, sonic, cement bond and variable density), laboratory (core) and field measurements data and geological information.</p> <p>The well logging course will essentially deal with geological strata identification and the determination of physical properties of petroleum fluids and reservoir rocks as well as includes the determination of the lithology of hydrocarbon reservoirs; rocks porosity, permeability, and fluids saturation distribution in hydrocarbon reservoirs.</p>	
Course objectives	<p><i>Basic Objective of the Course:</i></p> <ul style="list-style-type: none"> ▪ To equip students with the core concepts, methods and techniques of logging and interpretation. ▪ To prepare students for the industry environment <p><i>Specific Objectives of the Course:</i></p> <ul style="list-style-type: none"> ▪ To support the students academically, to improve their chance of realizing their potential. ▪ To give basic knowledge in geology and physics is required to understand petrophysical models. ▪ To encourage students' participation and interaction and fostering atmosphere of tolerance and respect ▪ To develop an understanding of the theory and practice of managerial analysis, and strategic decision making ▪ To develop an understanding of the theory in Well logging ▪ To furnish of students with the "Interpretation charts" ▪ To build background for the students further Well logging interpretation ▪ To introduce the key concepts of rock physics <p>Class assignments will be provided during class. The contents will be based on log interpretation, calculation of formation properties etc.</p> <p>Quizzes will cover the materials studied in previous classes. There will be 2 quizzes during the semester.</p> <p>Projects will mainly include case studies. Research skills and the techniques that learnt during homework assignments will be the tools to complete the projects.</p>	

Learning outcomes	<p>By the end of the course the students should be able:</p> <ul style="list-style-type: none"> ▪ Perform quick look interpretation of logs. ▪ Perform log interpretation of real case studies. ▪ Calculate field reserves. ▪ Use well-to-well correlations of logs to identify geological signatures of formations. ▪ Understand the math and physics behind each measurement technique and rock physics models. ▪ Evaluate elastic properties from log data and apply them to drilling and reservoir stimulation. ▪ Identify rock facies using velocity transforms. ▪ Build Rock Physics models for sandstone formations 		
Teaching methods	Lecture		x
	Group discussion		x
	Practical exercises		x
	Case analysis		x
Evaluation	Methods	Date/deadlines	Percentage (%)
	Midterm Exam		30
	Class Participation		5
	Assignments		10
	Quizzes		5
	Projects		10
	Final Exam		40
	Total		100
Policy	<p>A midterm exam is an exam given near the middle of an academic grading term or near the middle of any given quarter or semester. The purpose of the examination is that students have a better idea of whether they're advancing well in the course.</p> <p>The student receives 5 bonus points at the end of the semester if they attend all classes and follow all course policies and procedures.</p> <p>Assessment of the participant's activity in lectures, practical classes and in the learning process in general.</p> <p>A quiz is a quick assessment of student knowledge to test a students' level of comprehension briefly regarding course material, providing teachers with insights into student progress and any existing knowledge gaps.</p> <p>A project is a collaborative activity of students relating to scientific research. The reasons for including projects in the subject course is to show prospective students and research activity on the subject.</p> <p>A final examination is an examination administered at the end of an academic term, with a set of questions or exercises evaluating the skill or knowledge of students given to students at the end of a course of study.</p> <ul style="list-style-type: none"> ▪ Preparation for class The structure of this course makes your individual study and preparation outside the class extremely important. The lecture material will focus on the major points introduced in the text. Reading the assigned chapters and having some familiarity with them before class will greatly assist your understanding of the lecture. After the lecture, you should study your notes, assign chapters and get ready for class assignments. Throughout the semester students will also have practical exercises and quizzes. ▪ Withdrawal (pass/fail) This course strictly follows the grading policy of Graduate School of Science, Art 		

and Technology. Thus, a student is normally expected to achieve a mark of at least 60% to pass. In case of failure, he/she will be required to repeat the course the following term or year.

- **Cheating/plagiarism**
Cheating or other plagiarism during the Quizzes, Mid-term and Final Examinations will lead to paper cancellation. In this case, the student will automatically get zero (0) without any considerations.
- **Professional behavior guidelines**
The students shall behave in a way to create a favorable academic and professional environment during the class hours. Unauthorized discussions and unethical behavior are strictly prohibited.
- **Expected behavior.**
Includes attending all class activities; meeting deadlines; observing common courtesies to fellow students, teachers, and staff; being honest; making a diligent effort to learn; and does not engage in any disruptive irresponsible manner. Legitimate collaboration is encouraged but academic collusion or dishonesty will not be tolerated.
- **Class attendance**
Attendance is required! Please be in class on time. Attendance will be taken at the beginning of each class period. In case you are not present when the attendance sheet is passed on, you will be marked absent. If students who are late for lessons for more than 10 minutes to class will be marked absent, despite this, the student can still attend the class. You shall receive 5 bonus points at the end of the semester if you attend all classes and follow all course policies and procedures.
- **Class discussion**
Feel free to voice your opinions and ask questions anytime during a class period. Practice your right and freedom to learn. Remember you are here to learn, and we are here to teach and that teaching and learning are forever intertwined. You can help me teach you as much as I can help you learn. Be an active participant in the learning process!

Tentative Schedule

Week	Date/Day (tentative)	Topics	Textbook/ Assignments
1		Introduction to Petrophysics and Well logging: terminology and application. Logging techniques and measurements.	Ch.1
2		Well logging Environment, Wellsite. Lithology identification and physics of a reservoir.	Ch.2
3		Wireline and Measurement While Drilling (MWD) Well Logs. LWD.	Ch.3
4		Spontaneous Potential (SP), Caliper, and Gamma Ray (GR) Logs (tool physics, application and limitations)	Ch.4
5		Resistivity and Density Measurements (tool physics, application and limitations).	Ch.5
6		Holiday	
7		Neutron and Acoustic Porosity Logs (tool physics, application and limitations).	Ch.6
		NMR log and Residual Oil saturation. Quiz 1	Ch.7
8		Mid-term Exam	

9		Introduction to Rock Physics. Rock properties.	Ch.8
10		Porosity and Permeability Formation resistivity and water saturation.	Ch.9
11		Capillary pressure and wettability. Hydrocarbon pay.	Ch.10
12		Holiday	
13		Well Logging Data Interpretation: evaluation of lithology and log correlation.	Ch.11
14		Well Logging Data Interpretation: Evaluation of porosity, permeability and estimation of water saturation.	Ch.12
15		Hydrocarbon reserves estimation. Quiz 2	Ch.13 Ch.14
	TBA	Final Exam	

This syllabus is a guide for the course and any modifications to it will be announced in advance.